



**Australian Government**

---

**Department of the Environment and Heritage**

Assessment of the  
**Tasmanian Freshwater Eel Fishery**

November 2004

© Commonwealth of Australia 2004

This work is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced by any process without prior written permission from the Commonwealth, available from the Department of the Environment and Heritage. Requests and inquiries concerning reproduction and rights should be addressed to:

Assistant Secretary  
Wildlife Trade and Sustainable Fisheries Branch  
Department of the Environment and Heritage  
GPO Box 787  
Canberra ACT 2601

ISBN: [0 642 55106 5]

## **Disclaimer**

This document is an assessment carried out by the Department of the Environment and Heritage of a commercial fishery against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. It forms part of the advice provided to the Minister for the Environment and Heritage on the fishery in relation to decisions under Part 13A of the *Environment Protection and Biodiversity Conservation Act 1999*. The views expressed do not necessarily reflect those of the Minister for the Environment and Heritage or the Australian Government.

While reasonable efforts have been made to ensure that the contents of this report are factually correct, the Australian Government does not accept responsibility for the accuracy or completeness of the contents, and shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of this report. You should not rely solely on the information presented in the report when making a commercial or other decision.

# Assessment of the ecological sustainability of management arrangements for the Tasmanian Freshwater Eel Fishery

## TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>4</b>
Background.....	4
Overall assessment.....	6
Recommendations.....	7
<b>PART I - MANAGEMENT ARRANGEMENTS .....</b>	<b>9</b>
Conclusion .....	12
<b>PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES. 14</b>	
<b>STOCK STATUS AND RECOVERY .....</b>	<b>14</b>
<i>Maintain ecologically viable stocks.....</i>	<i>14</i>
Information requirements .....	14
Assessment .....	15
Management response.....	17
Conclusion .....	18
<i>Promote recovery to ecologically viable stock levels .....</i>	<i>19</i>
<b>ECOSYSTEM IMPACTS .....</b>	<b>19</b>
<i>Bycatch protection.....</i>	<i>19</i>
Information requirements .....	19
Assessment .....	20
Management response.....	21
Conclusion .....	21
<i>Protected species and threatened ecological community protection .....</i>	<i>22</i>
Information requirements .....	22
Assessment .....	22
Management response.....	22
Conclusion .....	23
<i>Minimising ecological impacts of fishing operations .....</i>	<i>23</i>
Information requirements .....	23
Assessment .....	23
Management response.....	24
Conclusion .....	25
<b>REFERENCES .....</b>	<b>26</b>
<b>LIST OF ACRONYMS .....</b>	<b>26</b>

## EXECUTIVE SUMMARY

### Background

The Tasmanian Inland Fisheries Service (IFS) has submitted a document for assessment under Part 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The draft document *Assessing the ecological sustainability of the Tasmanian Freshwater Eel Fishery – a report prepared for the Department of the Environment and Heritage for the purposes of Part 13A of the Environment Protection and Biodiversity Conservation Act 1999* (the submission) was received by the Department of the Environment and Heritage (DEH) in June 2003. The submission was released for a thirty-day public comment period that expired on 2 August 2004. No public comments were received.

The submission reports on the Tasmanian Freshwater Eel Fishery against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. The DEH assessment considers the submission and associated documents.

**Table 1: Summary of the Tasmanian Freshwater Eel Fishery**

<b>Area</b>	The fishery occurs in 38 of Tasmania's 48 water catchments, concentrated around the north and east of the state. Fishing mainly occurs in artificial impoundments with approximately 1% of waterways open to commercial eel fishing.
<b>Fishery status</b>	Unknown
<b>Target Species</b>	Shortfinned Eel ( <i>Anguilla australis</i> ) Longfinned Eel ( <i>Anguilla reinhardtii</i> )
<b>Gear</b>	Commercial fishery: Fyke nets and eel traps Recreational fishery: rod and line or a "bush pole"
<b>Commercial harvest</b>	Annual average catch in the region has been approximately 42 tonnes over the last 10 years. Shortfinned eels comprise 98% of this amount.
<b>Value of commercial harvest</b>	\$180,000 - \$200,000 gross annually. \$70 000 gross in 2004 (due to low prices on offer to fishers and a cold summer) <sup>1</sup>
<b>Recreational harvest</b>	Limited information. Estimated to be less than 2000 kg/annum.
<b>Commercial licences issued</b>	Limited entry fishery - 12 commercial licence holders (licences are transferable).
<b>Management arrangements</b>	<u>Commercial Fishery</u> : Licence conditions restrict fishers to individual water catchments, size limit, gear restrictions, spatial closures. <u>Recreational Fishery</u> : Bag limit (12), possession limit (24), minimum size limit (300 mm), gear restrictions.
<b>Export</b>	The catch is largely exported as frozen product to Europe, and live product to Asia with some value added product (mainly smoking) destined for the local domestic market <sup>2</sup>
<b>Bycatch</b>	Bycatch is low, consisting mostly of brown or rainbow trout species.

<sup>1</sup> Phil Boxall, Inland Fisheries Service (pers. comm.), August, 2004.

<sup>2</sup> Inland Fisheries Service website: [www.ifc.tas.gov.au/commercial](http://www.ifc.tas.gov.au/commercial)

<b>Interaction with Threatened Species</b>	Considered low. May be potential for interaction with galaxiid species that are currently being considered for listing under the EPBC Act, or the currently listed Tasmanian Giant Freshwater Crayfish.
--	---

Tasmania is comprised of 48 water catchments, of which 38 are allocated to commercial licences to fish for eels. Fishers are required to secure permission from landowners if they wish to fish in private water bodies and they are only allowed to fish in public waters if those waters are endorsed on their licence. The Tasmanian Freshwater Eel Fishery mainly takes place in artificial impoundments. All waters within World Heritage Areas (WHA), National Parks and State Reserves are excluded from commercial eel fishing operations and fyke netting for eels is only permitted in less than 1% of the State’s rivers and streams. The fishery targets both the shortfinned eel (*Anguilla australis*) and the longfinned eel (*Anguilla reinhardtii*). The shortfinned eel is found in all waters of Tasmania except the central western plateau whereas the longfinned eel is restricted to waters in the north east of the state. Consequently, the shortfinned eel forms the basis of the commercial fishery in Tasmania, comprising approximately 98% of the annual take. Fishers are required to retain redfin perch, carp and tench, all of which are introduced species and have little or no recreational or other value. No species can be retained as byproduct.

Both species of eel are also found in other parts of Australia, with the abundance of longfinned eels being greatest in Queensland and New South Wales, and the shortfinned eel being most common in Victoria and Tasmania. It is generally accepted throughout Australasia that each eel species belongs to a panmictic stock (free interchange of genes within an interbreeding population). This assumption has led to the opinion that fishing mortality in one catchment does not necessarily affect the eel population within the catchment, given the random recruitment from the single stock. An Australian study is currently underway to investigate the panmixia assumption for longfinned eels and preliminary results from this work indicate support for the panmixia hypothesis. A discussion of the implications of the panmixia hypothesis for the Tasmanian Freshwater Eel Fishery and of this research is found under Principle 1, Objective 1.

It is believed that freshwater eel species spawn in the Coral Sea at depths greater than 300 m, however the exact location of spawning grounds is unknown. At the time of spawning, eels may be in excess of 16-20 years old, although estimates of age for freshwater eel larvae indicate that the two species spawn at different times. Following spawning, the adults die.

Once hatched, the eel larvae drift with ocean and coastal currents, dispersing along the Eastern Australian Seaboard and into the Tasman Sea. As the larvae approach the Australian coast, they metamorphose from the leaf shaped larvae (leptocephali) into a transparent “glass eel”. The larval period is thought to last from 12 to 18 months, after which the glass eels develop pigmentation and functional teeth and are called “elvers”. A second migration is evident when glass eels and elvers move from the estuaries into lakes, swamps and the freshwater reaches of rivers and creeks. Following the second migration, freshwater eels enter a sedentary feeding stage where they are known as “yellow eels”. As freshwater eels approach maturity, they move downstream once again to the entrances of rivers and creeks before beginning their spawning migration. At this time a number of physical changes occur, including the belly becoming silvery-white. Consequently, eels at this life stage are known as “silver eels”. These eels do not feed. Silver eels leave the estuaries from late summer to autumn to begin the spawning migration to the Coral Sea.

The growth rate of eels is dependent upon habitat, with those in warmer climates exhibiting a more rapid growth than those in cooler, running water. Although females of both species produce between 5 and 10 million pelagic eggs, the fact that they spawn only once and are long-lived, means that strict management controls may be required to ensure the sustainability of the harvest.

The commercial fishery for eels in Tasmania commenced in the mid 1960s. The commercial catch of eel varied widely during the early stages of the fishery but has stabilised during the last ten years. The early variation in harvest was caused by a number of factors including; changes in the number of licenced fishers, changes in regulations, fluctuations in recruitment for some major waters and changes in waters fished by individual fishers. Over a 20 year period up to 2002, the average catch of shortfinned and longfinned eel was 41476 kg and 658 kg respectively. The shortfinned eel is clearly the most prevalent of the two species, constituting 98% of the commercial harvest. Over the last ten years the average harvest of eel has been approximately 42 tonnes per annum, with shortfinned eels comprising 98% of this amount.

The economic value of the fishery is relatively low, with the fishery typically valued at around \$180,000 - \$200,000 gross annually. However, in 2004 the fishery has been worth around \$70 000 gross. This decline in value has been attributed to low prices on offer to fishers and the cold summer (P. Boxall, Inland Fisheries Service, *pers.comm.*, 2004).

Tasmania's inland waters sustain 12 commercial licence holders. All commercial fishing licences endorsed to harvest freshwater eels are comprised of water catchment areas, thus avoiding any overlapping in fishing operations between licence holders. The Tasmanian Freshwater Eel Fishery avoids targeting migrating silver eels by only allowing fyke netting in 1% of waterways. Immigrating glass eels are also not targeted in the fishery, although a permit has recently been issued by IFS to attempt to harvest commercial quantities of this sector. Currently, glass eels are protected through regulations on the mesh size of gear, which ensures the mesh size is too large to capture glass eels. All commercial fishing equipment must be checked and cleared every 24 hours and every fyke net and eel trap must contain an approved excluder screen to avoid incidental bycatch. Where fishers are given exemption to use fyke nets with larger screens, the codends of the fyke nets must be raised at least 300 mm clear of the water surface. Fishery management arrangements also include minimum size limits (300 mm for commercial and recreational fisheries) and bag and possession limits for recreational fishers (12 eels and 24 eels respectively).

IFS's submission states that no byproduct is taken in the fishery but that the possibility exists for the incidental capture of species, including some protected species. Waters in which known populations of protected species occur are closed to fishing by the commercial sector, and no listed threatened ecological community is known to overlap in distribution with the Tasmanian Freshwater Eel Fishery. Bycatch and protected species interactions are discussed under Principle 2 of this report.

Minimal information is available regarding the pressure on eel stocks in Tasmania by the recreational sector, although anecdotal evidence suggests that this harvest is small and less than 2000 kg/annum. This estimate is supported by results from the National Recreational and Indigenous Fishing Survey (NRIFS) (Henry and Lyle, 2003).

The Tasmanian Freshwater Eel Fishery is managed according to the *Inland Fisheries Act 1995* and *Inland Fisheries Regulations 1996*.

## **Overall assessment**

The material submitted by IFS indicates that the Tasmanian Freshwater Eel Fishery operates in accordance with the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. DEH considers that the Tasmanian Freshwater Eel Fishery is a well-managed fishery that is unlikely to have an unacceptable or unsustainable impact on the environment in the short to mid term. Recommendations have been developed to ensure that the risk

of impact is minimised in the longer term. Overall, the precautionary management regime of a significant number of waterways closed to commercial fishing, the protection of immigrating glass eels and emigrating silver eels and the requirement of bycatch exclusion screens on all gear used in the fishery suggests that the fishery is being managed in an ecologically sustainable way.

In making its assessment, DEH considers that the management arrangements implemented in the fishery are sufficient to ensure that the fishery is conducted in a manner that does not lead to over-fishing and that stocks are not currently overfished. Considering the management arrangements and the benign characteristics of the fishery operations, DEH considers that fishing operations are managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem. DEH is confident that IFS will continue to provide high quality management.

The assessment finds that the fishery is managed in an ecologically sustainable way and its operation is consistent with the objects of Part 13A of the EPBC Act. DEH recommends that the export of species taken in the fishery should be exempt from the export requirements of Part 13A of the EPBC Act, with that exemption to be reviewed in five years. DEH considers that the fishery, as managed in accordance with the current management regime is not likely to cause serious or irreversible ecological damage over this period.

The assessment also considered the possible impacts on the World Heritage values of the WHA within Tasmania and the possible impacts on the ecological character of the Interlaken (Lake Crescent) Ramsar site. DEH notes that all WHA within Tasmania are closed to the Tasmanian Freshwater Eel Fishery, which serves to protect areas of the WHA from the impacts of this fishery. The assessment also found that the management regime in place was consistent with the values for which the Interlaken (Lake Crescent) Ramsar site was listed. On this basis, DEH considers that an action taken by an individual fisher, acting in accordance with the fishery management regime, would not be expected to have a significant impact on the World Heritage matter, or on the Ramsar Wetland protected under the EPBC Act.

To further strengthen the effectiveness of the management arrangements for the Tasmanian Freshwater Eel Fishery, and to contain the environmental risks in the medium to long term, DEH has developed a series of recommendations. The implementation of these and other commitments made by IFS in the submission will be monitored and reviewed as part of the next DEH review of the fishery in five years time.

## **Recommendations**

1. IFS to advise DEH of any material changes to fishery management arrangements that could affect the criteria on which EPBC decisions are based, within 3 months of that change being made.
2. By the end of 2005, IFS to develop fishery specific objectives linked to performance indicators and performance measures for target, bycatch and protected species and impacts on the ecosystem.
3. IFS to monitor the status of the fishery in relation to the performance measures once developed. Within 3 months of becoming aware of a performance measure not being met, IFS to finalise a clear timetable for the implementation of appropriate management responses.
4. From 2005, IFS to report publicly on the status of the fishery on an annual basis, including explicit reporting against each performance measure once developed

5. Should the Australian study on *A. reinhardtii* determine that eel stocks harvested in the fishery are not panmictic, IFS to investigate the feasibility and need for research to test the panmixia assumption in *A. australis*. If it is found that the panmixia hypothesis is not true for *A. australis*, IFS to develop and implement management measures to ensure that catchment fidelity is adequately taken into account and that sustainability objectives for the stock can still be achieved.
6. In the event that commercial quantities of glass eels are able to be harvested from Tasmanian waters, IFS to develop and implement a precautionary management strategy to control the level of glass eel harvest and potential impacts on target and bycatch species and the ecosystem. The strategy is to be reviewable and include objectives linked to performance measures. It should also include mechanisms to enable ongoing monitoring of the fishery and take into account the impact of environmental conditions on the fishery.
7. IFS to introduce a system sufficient to monitor bycatch, including protected species, in the Tasmanian Freshwater Eel Fishery and to identify changes in composition and abundance spatially and temporally.

## PART I - MANAGEMENT ARRANGEMENTS

The Tasmanian Freshwater Eel Fishery is managed by the IFS. It is a limited entry, input controlled fishery, with enforceable restrictions on effort, gear design, and waters open to commercial fishing.

The management regime is described in the following documents, all of which are publicly available:

- *The Inland Fisheries Act 1995*;
- *The Inland Fisheries Regulations 1996*; and
- Eel fishery access licence conditions.

A number of other documents including research reports and scientific literature are integral to the management of the fishery.

DEH considers it important that management arrangements remain flexible to ensure timely and appropriate managerial decisions. Due to the importance of the management plan and documents referred to above to DEH's assessment of the fishery, an amendment could change the outcomes of the assessment and decisions stemming from it. Decisions arising from this assessment relate to the arrangements in force at the time of the decision. In order to ensure that these decisions remain valid, DEH needs to be advised of any changes that are made to the management regime and make an assessment that the new arrangements are equivalent or better, in terms of ecological sustainability, than those in place at the time of the original decision.

**Recommendation 1:** *IFS to advise DEH of any material changes to fishery management arrangements that could affect the criteria on which EPBC decisions are based, within 3 months of that change being made.*

Management of the Tasmanian Freshwater Eel Fishery is achieved through a consultative process that includes the Department of Primary Industries, Water and Environment (DPIWE), the Tasmanian Professional Eel Fishers Association (TPEFA), the Inland Fisheries Advisory Council (IFAC) and IFS. Consultation with all groups involved must be conducted before any management or policy decisions are approved.

While management of the fishery is primarily the responsibility of IFS, IFS seeks advice from IFAC, which is established under the provisions of Section 20A of the *Inland Fisheries Act 1995*. IFAC is the peak advisory body for matters related to the functions of IFS and its overall role is to provide strategic advice to the Minister on all aspects of freshwater fishery management and fishing policy. Membership of IFAC is comprised of representatives from non-government organisations, with knowledge and experience in commercial fishing, fish processing, fish marketing, recreational fishing, aquaculture, conservation of freshwater ecosystems and tourism.

IFS is also engaged in cross-jurisdictional consultation on eel management through the Australian and New Zealand Eel Reference Group (ANZERG), which was established in 1997 under the then Standing Committee on Fisheries and Aquaculture. The role of ANZERG includes the development of a coordinated approach to eel management on a regional basis, thereby ensuring consistent management practices. Membership of ANZERG includes all Australian States plus New Zealand, consisting of one eel aquaculture representative (government) and one eel fisheries representative (government) per state. The submission notes that any applicable directives from ANZERG will be incorporated where appropriate into the management of the Tasmanian Freshwater Eel Fishery.

DEH strongly encourages the effective use of ANZERG to ensure that cross-jurisdictional issues relating to eel harvesting are appropriately managed. DEH also urges ANZERG to ensure that

appropriate representation is achieved so that cross-jurisdictional issues can be fully addressed. Overall, DEH considers the level of consultation and use of expertise knowledge to be adequate and is confident that IFS will continue to ensure interested parties are consulted appropriately.

The IFS manages the Freshwater Eel Fishery under the *Inland Fisheries Act 1995* and the *Inland Fisheries Regulations 1996*. Management of the fishery relies heavily on a precautionary approach to ensure sustainable harvests of eel. For example, the majority of commercial fishing for eels with fyke nets occurs in artificial impoundments, with fyke netting permitted in less than 1% of waterways. Although fishers are able to fish in some rivers with eel traps, the level of effort using this method is small, with only one commercial eel fisher actively using traps in the last five years. This regulated fishing, which causes targeting of emigrating silver eels to be minimised, ensures that sufficient spawning stock are able to complete the migration to the ocean. Similarly, regulations governing the mesh size of gear ensure that glass eels are not able to be targeted by the fishery, which ensures that recruitment overfishing does not occur. The ecological sustainability of the fishery relies heavily on these two measures. In addition, all commercial eel fishers must correctly fill out catch returns for each day's fishing as a condition of their licence. This, combined with the fact that all commercially fished public waters are identified through a Geographic Information System (GIS), MapInfo database, allows IFS to closely monitor production from individual waters and water catchment areas, thus allowing IFS to detect and react to any dramatic changes in the fishery. An assessment of the effectiveness of these measures is included in Part II of this report.

In order to set performance indicators for a fishery, information on population parameters including age structure, natural mortality, growth, spawning stock size and recruitment size are usually required. The submission notes that due to the unique biological attributes of eels, and the lack of specific knowledge regarding their biology, it is difficult to develop such indicators for eel stocks.

DEH notes that there are no clearly defined management objectives to guide overall management of the fishery, including for bycatch and protected species and ecosystem impacts. DEH also notes that regular monitoring of the performance of the fishery is not conducted (with the exception of target stock status), particularly in relation to overall impacts on the target species, bycatch, protected species and the ecosystem. While sound management measures are available, such as reduction in fishing effort, closure of a particular water body and/or closure of the entire fishery, there is no clearly defined point at which these measures are reviewed and implemented.

DEH considers that objectives, indicators and measures for target and bycatch species, protected species interactions and ecosystem impacts need to be developed to ensure that the performance of the fishery can be measured and management action taken as required.

While DEH recognises the inherent difficulty in setting biologically based reference points for the Tasmanian Freshwater Eel Fishery, precautionary performance measures are possible. For example, indicators could include a change in catch per unit effort for target species, a change in the composition and/or abundance of bycatch species or frequency of protected species interactions, or a change in the number of unmodified streams fished. In order for performance assessment to result in appropriate management action a process for responding to breaches of performance measures is also required.

**Recommendation 2:** *By the end of 2005, IFS to develop fishery specific objectives linked to performance indicators and performance measures for target, bycatch and protected species and impacts on the ecosystem.*

**Recommendation 3:** *IFS to monitor the status of the fishery in relation to the performance measures, once developed. Within 3 months of becoming aware of a performance measure not being met, IFS to finalise a clear timetable for the implementation of appropriate management responses.*

Management of the fishery is achieved mainly through input restrictions. Such controls include:

- Spatial closures (all waterways within WHA, State Reserves and National Parks are closed to commercial fishing);
- Limited entry – Fishery closed to new applicants, licences are transferable;
- Restrictions on gear type;
- All gear required to include a bycatch excluder screen or, if exempted, to have the codends of fyke nets raised above the water surface;
- Waters and catchment areas allocated to individual licence holders;
- Gear must be checked and cleared every 24 hours;
- Minimum size limit; and
- Bag and possession limits for the recreational fishery.

IFS currently has ten Fisheries Officers who have the power to enforce conditions created under the *Inland Fisheries Act 1995* and the *Inland Fisheries Regulations 1996*. Such enforcement is achieved through random inspections on commercial eel fishers, including physical checks on the fishing activity and fishing return checks. Approximately 18 inspections are conducted per annum. The level of compliance by commercial fishers is high with just two prosecutions in the last 15 years. DEH considers that these compliance measures are appropriate to the size and scale of the fishery and contain the means of enforcing critical aspects of the management arrangements for the fishery. Given the large geographical spread of the fishery, IFS may find that a compliance risk assessment would prove beneficial in identifying areas where enforcement resources could be more strategically concentrated. DEH urges IFS to consider the benefit and feasibility of conducting such a risk assessment in the near future.

IFS reviews the performance of the commercial fishery annually, including all management strategies and policies. This review is undertaken in conjunction with stakeholders, including the IFAC and the TPEFA. IFS has the power to refine the management of the fishery if any assessment of the fishery indicates that a change to the management is required, for example if the same level of effort yielded a significantly decreased harvest or if a significant impact on a protected species was observed. DEH considers that public reporting of performance of the fishery would enhance transparency and public accountability, and therefore suggests that IFS publicly report against each fishery performance measure on an annual basis (note that a requirement for the development of performance measures for the fishery is expressed in **Recommendation 2**).

**Recommendation 4:** *From 2005, IFS to report publicly on the status of the fishery on an annual basis, including explicit reporting against each performance measure, once developed.*

Fishery-dependent data relating to the target species is collected on a regular basis in the fishery. Some fishery independent information is also collected. Discussion of the information collection system can be found in Part II of this report.

Environmental impacts of activities undertaken as part of the fishery are considered minimal based on the passiveness of the equipment utilised. A more thorough analysis of the fishery's capacity for assessing, monitoring and avoiding, remedying or mitigating any adverse impacts on the wider marine ecosystem in which the target species lives and the fishery operates is contained under Principle 2 of this report.

IFS, along with the TPEFA and the Animal Ethics Committee aligned with DPIWE, have agreed on set protocols that all commercial eel fishers must adhere to in order to reduce the risk of incidental bycatch. This includes all equipment having bycatch excluder screens and, in approved cases, all codends to be raised at least 300 mm above the water surface. IFS has also conducted bycatch reduction trials on a number of fyke net designs to reduce the incidence of bycatch. DEH is satisfied that such measures help to reduce the risk of bycatch associated with the Tasmanian Freshwater Eel Fishery. This issue is discussed further in Part II of this report. DEH considers that the current management arrangements comply with all relevant threat abatement plans, recovery plans and the National Policy on Fisheries Bycatch. DEH expects that IFS will also ensure compliance with any future plans or policies as they are developed.

Some international regimes are applicable to fisheries management but do not explicitly involve this fishery, for example the 1992 Convention on Biological Diversity and the 1995 Jakarta Mandate requiring that, in relation to the sustainable use of marine and coastal biological diversity, the precautionary principle should apply in efforts to address threats to biodiversity. While these agreements are not specifically addressed in the submission, the fishery's compliance with their requirements can be assessed by examination of Part II of this report.

The submission describes how the Tasmanian Freshwater Eel Fishery is guided by ANZERG. It states that ANZERG is the appropriate body to ensure the conservation and management of eels as 'straddling stocks' in the South Pacific region. This arrangement is in accordance with the United Nations Agreement for the "Implementation of the Provisions of the United Nations Convention on the Law of the Sea (UNCLOS) of December 10, 1982, Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks". The objective of this Agreement is to ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks beyond areas under national jurisdiction through effective implementation of the relevant provisions of the convention. DEH is satisfied that while ANZERG is functional, its role and terms of reference are relevant to ensuring a sustainably managed eel fishing regime throughout the region. However, if ANZERG is unable to achieve its Terms of Reference, DEH suggests that IFS continue to cooperate with other relevant jurisdictions to pursue complementary management and research of shared stocks.

DEH considers it is incumbent on all authorities to develop a thorough understanding of the framework of national, regional and international agreements and their applicability to export-based fisheries for which they are responsible.

All waters contained within WHA's are closed to the Tasmanian Freshwater Eel Fishery, however the fishery does operate near the Interlaken (Lake Crescent) Ramsar site. Under the EPBC Act, a person may not take an action that has, will have or is likely to have a significant impact on the world heritage values of a declared World Heritage property or on the ecological character of a declared Ramsar wetland. People that are taking actions that are a lawful continuation of a use of land, sea or seabed, that was occurring immediately before the commencement of the EPBC Act, may continue to take those actions. An enlargement, expansion or intensification of a use is not a continuation of a use. Tasmania's WHA's are protected from the impacts of eel fishing through spatial closures, while the Interlaken (Lake Crescent) Ramsar site is protected through precautionary management arrangements such as closed waterways, the protection of immigrating glass eels and emigrating silver eels and through the relatively benign impact of fishing gear on the environment. For this reason, and the outcomes of the assessment as listed throughout Part II of this assessment report, DEH considers that fishing activities as currently practiced in this fishery are unlikely to have a significant impact on the World Heritage values of WHA's in Tasmania or on the ecological character of the Interlaken (Lake Crescent) Ramsar site in the next five years. Any

significant change to existing practices, which is likely to significantly impact on WHA value or on the ecological character of Interlaken (Lake Crescent) Ramsar site may require approval by the Australian Government Minister for the Environment and Heritage.

## **Conclusion**

DEH is satisfied that the Tasmanian Freshwater Eel Fishery management regime is documented, publicly available and transparent, and is developed through a consultative process. The implementation of **Recommendation 2** will ensure that the management arrangements are adaptable and underpinned by appropriate objectives and performance criteria by which the effectiveness of the management arrangements can be measured, enforced and reviewed.

The management arrangements are capable of controlling the harvest through a combination of input and output controls appropriate to the size of the fishery. Periodic review of the fishery is provided for, as are the means of enforcing critical aspects of the management arrangements.

The management regime takes into account arrangements in other jurisdictions, and adheres to arrangements established under Australian laws and international agreements.

DEH considers that there is scope to further refine the management arrangements and has provided a number of recommendations for improvements in the longer term.

## **PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES**

### **Stock Status and Recovery**

Principle 1: *‘A fishery must be conducted in a manner that does not lead to over-fishing, or for those stocks that are over-fished, the fishery must be conducted such that there is a high degree of probability the stock(s) will recover’*

### **Maintain ecologically viable stocks**

Objective 1: *‘The fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability’*

### **Information requirements**

Fishery dependent data has been collected from compulsory daily catch logbooks since 1996. The daily logbooks require fishers to provide: the water catchment number, name of the water body, gear code, the number of gear, number of hours the gear was set for, species code (shortfinned or longfinned eel), feeding or migrating, the amount released (kg), total caught (kg), amount transferred (kg), name of water body transferred to and amount held (kg) for sale. The catch return must be sent to IFS by the 15<sup>th</sup> day of the following month.

Commercial logbooks are validated by comparing the catch sold information with fish dealer’s returns. IFS believes that the data produced from the logbooks is reliable and meaningful. The majority of fishers catch records match their total sales, potentially due to the significant penalties that are associated with under declaring the landed catch on the fishing returns. In addition, IFS follows up discrepancies in the catch returns with the fisher at the time of data entry, which is generally within 7 days of receipt of the catch return. This provides IFS with a high degree of confidence in the data provided. DEH believes that fishery dependent data reliability for target species is reasonable.

Fishery independent data collection is limited, mainly due to the small size of the Tasmanian Freshwater Eel Fishery and its small contribution to the Tasmanian economy. A number of projects have, however, examined eel populations around the state. This has included a glass eel resource assessment and assessment of juvenile eel stocking practices, species distribution and ecology. In addition, IFS conducts state-wide distribution surveys on all freshwater ecosystems, which includes collecting and recording data on eels. The surveys utilise standard freshwater sampling tools such as electroshocking, gill and fyke netting, and setting stationary traps in all habitat types. These ecosystem surveys are used to detect any changes in the eel population and to potentially trigger a management response.

IFS collects data from a wide range of sources (logbooks, fish dealer’s returns, survey data and related research data) in an effort to counteract the lack of fishery independent data. DEH considers this a useful approach given the economic and resource constraints under which the fishery operates.

Overall, given the range of fishery dependent and independent data gathered by IFS and the mechanisms for regularly reviewing the data requirements, DEH considers that there is a reliable information collection system in place appropriate to the scale of the fishery.

## Assessment

Eel stocks and the proportion of stocks that can be sustainably harvested are not assessed in this fishery. DEH recognises the inherent difficulties in eel stock assessment and uncertainties surrounding population dynamics. Such uncertainties arise from the fact that eel population dynamics are unique in that they:

- are catadromous;
- have a relatively low natural mortality rate;
- are environmentally sex determined;
- are presumed to be a panmictic stock;
- have late maturation; and
- die after spawning.

Also, like other eel populations in Australia, the Tasmanian eel population is greatly affected by environmental conditions, particularly drought. Consequently, the management of the fishery relies on precautionary measures to ensure that overfishing does not occur.

IFS assesses all catch statistics from licence holders annually to determine the level of catch per unit of effort. This is used as a guide to the status of the fishery within licenced areas. In addition, IFS samples eels from around the state measuring basic biological parameters. The submission notes that should these measurements indicate that an area needs to be protected or regulated from commercial fishing, IFS has the power to enforce this under the *Inland Fisheries Act 1995* and the *Inland Fisheries Regulations 1996*. Such indicators include the level of take being too high (not sustainable with the level of recruitment) or fishing operations causing a detrimental impact on any protected species. Protection measures in these instances could include protecting an area through closure, or effort or harvest restrictions.

These assessments are not comprehensive stock assessments, however no reliable biomass estimates have been conducted for either species in Australia, or in virtually all regions of the world where eels are harvested. Similarly, no estimates of the relationship between spawning stock biomass and recruitment have been established for Tasmanian eel populations. Given the life history characteristics of the species' described above, it is unlikely that a traditional stock assessment could be undertaken that was commensurate with the value and size of the fishery.

IFS is of the opinion that the commercial harvest of eels would have a limited impact on the reproductive capacity of the species given that less than 1% of the state's rivers and streams are commercially fished with fyke nets, with most fishing occurring in impoundments. Of the 99% of waterways closed to fyke netting, approximately 50% are in an unmodified state, which allows silver eels to complete their spawning migration. This provision for good escapement allows adult eels to migrate to the spawning grounds in the Coral Sea and therefore supply recruits for the fishery, which in turn will effectively maintain the spawning biomass. DEH considers that, in the absence of a traditional stock assessment, this precautionary measure is adequate for the protection of eel stocks.

The distribution of both shortfinned and longfinned eel in Tasmania is well known. Fishery dependent catch returns are a condition of licence and are quantified by allocated water and/or stock enhanced water fished. All public waters commercially fished for eels are incorporated into a GIS linked database, which allows more accurate reporting of catch by water, improved monitoring of eel stocks and management of the fishery on a catchment/water basis. Since Tasmanian waters represent the southern limit of longfinned eel distribution, the fishery has the potential to contract the natural distribution of the species by overfishing waters in which it occurs. However, the longfinned eel is only targeted by one commercial fisher in one Tasmanian catchment, while it is

known to occur in at least 39 Tasmanian catchments. The species is captured by other licenced fishers but is returned to the water due to the difficulty in capturing a commercial quantity of the longfinned eel (P Boxall, Inland fisheries Service, *pers.comm.*, 2004). Therefore, DEH considers that the Tasmanian Freshwater Eel Fishery is unlikely to significantly impact the natural distribution of longfinned eel.

Reproduction of both species of eel is believed to occur in oceanic areas, and recruitment to freshwater habitats is random. It is currently assumed that both species of eel belong to panmictic stocks, which suggests that the biodiversity and reproductive capacity are unlikely to be affected by the level of fishing pressure in individual waters. Thus, the precautionary approach of protecting both immigrating glass eel stock and emigrating silver eel stock in defined closed waterways and catchments, contributes significantly to the sustainability of eel resources in Tasmania.

Recent studies on European eels appear to cast some doubt on the validity of the panmixia assumption. Genetic studies currently underway at Southern Cross University to test the panmixia hypothesis may clarify the matter for longfinned eels (*Anguilla reinhardtii*). Although the Tasmanian Freshwater Eel Fishery is predominantly based on the shortfinned eel (*Anguilla australis*), results from the longfinned eel study may indicate support or otherwise for the panmixia hypothesis, which in turn may warrant a similar study focusing on shortfinned eel. If it is found that the panmixia hypothesis is not true for eel species, it is likely to have important implications for management of the Tasmanian Freshwater Eel Fishery, with management potentially needing to be on a catchment by catchment basis, rather than a regional basis.

**Recommendation 5.** *Should the Australian study on A. reinhardtii determine that eel stocks harvested in the fishery are not panmictic, IFS to investigate the feasibility and need for research to test the panmixia assumption in A. australis. If it is found that the panmixia hypothesis is not true for A. australis, IFS to develop and implement management measures to ensure that catchment fidelity is adequately taken into account and that sustainability objectives for the stock can still be achieved.*

Potential removals from the freshwater eel population include direct harvest by this fishery, recreational harvest and discarding of the species in this fishery. While IFS has the capacity to collect catch data from the commercial fishery, limited information is available on the level of recreational and indigenous harvest of freshwater eels. Field observations made by Fisheries Officers suggest that the recreational angling pressure is very low, estimated at less than 2000 kg/annum. The small harvest of eel by Tasmanian recreational fishers is also demonstrated by results from the NRIFS, which show that approximately 8239 eels are taken in Tasmania annually, compared to 170 654 eels taken Australia wide (Henry and Lyle, 2003).

Take by the recreational sector is managed through a minimum size limit (300 mm), and bag (12 eels/day) and possession (24 eels) limits. Gear restrictions and areas open to recreational fishing are also enforceable. Freshwater eels are not considered to be an important recreational species, with most recreational fishers targeting brown and rainbow trout. Indigenous take of eel in Tasmania is considered to be negligible. While the estimated take by recreational fishers indicates that the impact of the recreational take is likely to be low, DEH urges IFS to examine the feasibility of collecting data on the take by these sectors to be included in the annual review of the fishery.

Commercial eel fishers are required to record the amount of undersize eels released back to the water, or transferred, in their logbooks. Such recording provides a good indication of the regularity that undersize eels are discarded. DEH considers the ongoing collection of data and monitoring for

discards is an important component to enable changes in eel size and fisher behaviour to be detected over time.

Anguillid eel stocks are also harvested by other States, namely Victoria, New South Wales and Queensland. At the July 2002 meeting of ANZERG at which all states, except Queensland, were represented, a recommendation was made to integrate catch and effort data from all sectors and start an ongoing program of comparing and validating State catch return data against Australian Quarantine and Inspection Service export data. DEH strongly encourages uptake of this recommendation and believes that ensuring that multi-jurisdictional harvest of eels is adequately considered and validated by all sectors is an important step in the future management of all Australian eel fisheries.

### **Management response**

The current management regime for the Tasmanian Freshwater Eel Fishery aims to maintain ecologically viable stock levels through a range of input controls. These measures are outlined in Part I of this report.

The fishery is managed as a closed fishery, with 12 licence holders (that are renewed annually) currently in operation. Water catchments are allocated to individual fishers and listed on the licences, with those areas only being able to be fished commercially by the holder of that licence. Fishing with fyke nets is permitted in less than 1% of Tasmanian rivers and streams. Of the remaining 99% of rivers and streams, approximately 50% are currently in an unmodified state. These limitations on areas open to commercial fishing result in a very high potential for escapement of spawning stock and therefore prevent recruitment overfishing. Some licence holders have variations to use fyke nets of differing dimensions to those allowed under the *Inland Fisheries Act 1995* and the *Inland Fisheries Regulations 1996*. These variations are for particular waters where different designs are utilised due to the water fished (ie. deep water near hydro-electric intake towers). Applications for variations are assessed by IFS, with the main criteria for approval being that no other species will be impacted upon.

The fishery is also managed through a range of gear restrictions and licence conditions under the *Inland Fisheries Act 1995* and the *Inland Fisheries Regulations 1996*. In addition, all waters within WHA's, National Parks and State Reserves are protected from any commercial eel fishing in Tasmania. DEH concurs with IFS that this approach is precautionary.

DEH has concerns about the potential development of a glass eel fishery in Tasmania. The submission notes that elvers naturally migrate during warmer months and accumulate at the base of dams. Trevallyn tailrace (Tamar River) and Meadowbank Dam (Derwent River) are two locations where elvers are known to accumulate in large densities annually. The submission states that if these elvers were not harvested by IFS, it is likely that they would die and in excess of 2 500 000 juvenile eels would be lost each year. Harvested elvers are offered to fish farmers and licenced eel fishers on the mainland and are also released in waters upstream of barriers to maintain conservational and biological values of the waters.

Due to the large number of elvers that accumulate at these two sites in particular, it is assumed that large numbers of glass eels are also present, and interest in exploiting this resource has been shown over the years. To date, IFS has been unsuccessful in securing commercial quantities of glass eel, and concentrates on harvesting stranded elver instead. IFS has issued permits in the past to persons wishing to harvest glass eel but these ventures have also not yielded viable quantities of glass eel.

Due to the interest in the development of a glass eel sector, level of harvest in the glass eel sector has the potential to considerably increase. Because no such fishery exists, few data, if any, have been collected, there are no measures in place to control harvest and no comprehensive strategy is in place for future management. DEH considers that, should permit holder(s) be able to harvest commercial quantities of glass eel, any future expansion of this sector must be accompanied by a strategy that will guide the future management of this sector and provide adequate monitoring of glass eel harvest. Given the current lack of data, a precautionary strategy should be articulated which would provide parameters for the expansion of the glass eel sector, in the event that commercial quantities are able to be harvested (note that IFS will need to identify what level of harvest would be considered a commercial quantity). In addition, since eel populations are influenced by environmental factors, the precautionary strategy should consider the impact of environmental conditions on the fishery.

**Recommendation 6:** *In the event that commercial quantities of glass eels are able to be harvested from Tasmanian waters, IFS to develop and implement a precautionary management strategy to control the level of glass eel harvest and potential impacts on target and bycatch species and the ecosystem. The strategy is to be reviewable and include objectives linked to performance measures. It should also include mechanisms to enable ongoing monitoring of the fishery and take into account the impact of environmental conditions on the fishery.*

Currently, no specific indicators are used in the fishery to determine when a management response is required, however a recommendation to develop these has been made (see **Recommendation 2**). In the absence of specific indicators, IFS relies on the adoption of a precautionary approach through closed waterways, and through the encouragement of stock enhancement in appropriate waters. IFS also undertakes random sampling of eel populations around the state, enabling IFS to gauge the status of the stocks. According to the submission, the greatest impediment for undertaking more intensive eel research is the provision of funding for such a small-scale fishery.

The *Inland Fisheries Act 1995* and the *Inland Fisheries Regulations 1996* prohibit the retention of any species (other than eels, redfin perch, tench and carp). In the event that carp are captured, IFS is to be notified and all carp are to be retained for collection by an IFS officer. Any native fish species that is incidentally harvested with eels, must be returned to the water immediately unharmed.

## **Conclusion**

DEH considers that the management regime in the Tasmanian Freshwater Eel Fishery is appropriately precautionary and provides for the fishery to be conducted in a manner that does not lead to over-fishing. DEH considers that the information collection system, protection of spawning stock biomass and management arrangements generally are sufficient to ensure that the fishery is conducted at catch levels that maintain ecologically viable stock levels with acceptable levels of probability.

DEH considers that there is scope to further refine some of the existing information collection, assessment and management responses and has provided a number of recommendations for improvements in the longer term.

## Promote recovery to ecologically viable stock levels

Objective 2: *'Where the fished stock(s) are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes'*

This objective is not applicable to the Tasmanian Freshwater Eel Fishery at this time. As noted previously, IFS has a number of management practices in place to ensure the sustainable management of the fishery. IFS believes that protecting a significant proportion of the eel population from commercial fishing will ensure continued silver eel escapement and resulting juvenile eel recruitment. However, DEH considers that the fishery would benefit from having a performance indicator in place to detect a change in the fishery that indicates the fishery is being overfished. A recommendation to this effect has been made previously (see **Recommendation 2**).

Management responses in such instances may include reduction in fishing effort, closure of a particular waterway and/or closure of the entire fishery. These responses would be implemented under the *Inland Fisheries Act 1995* and any change in management would involve the input of representatives of key stakeholder groups.

### Conclusion

DEH is satisfied that the management regime in the Tasmanian Freshwater Eel Fishery is appropriately precautionary and provides for the fishery to be conducted in a manner that does not lead to over-fishing. DEH is also satisfied that stocks are not currently overfished, but should that occur in the future, the fishery is conducted such that there is a high degree of probability the stocks would recover.

### Ecosystem impacts

Principle 2: *'Fishing operations should be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem'*

### Bycatch protection

Objective 1: *'The fishery is conducted in a manner that does not threaten bycatch species'*

### Information requirements

IFS acknowledges that the recording of composition and abundance of bycatch within the Tasmanian Freshwater Eel Fishery is limited. Data collection is restricted to frequent, but random, spot checks conducted by IFS compliance personnel, supplemented by anecdotal evidence supplied by eel fishers to IFS staff. The reporting of bycatch that is not returned to the water live is encouraged, but is not required to be recorded by commercial fishers in their logbooks.

Elvers are known to accumulate at the base of Meadowbank Lake dam and Trevellyn tailrace and, because the elvers are likely to perish if left at the base of these dams due to the high density and predation, IFS routinely harvests elvers at these sites. At the Meadowbank Lake dam site, if the catch is to be moved out of the catchment, the catch is graded, separating fish species from eels (occasional incidental catches of both lampreys and climbing galaxias occurs). At both locations of elver harvesting, IFS records any bycatch species and abundance and how this bycatch is dealt with. In contrast, there is no requirement for commercial fishers to keep a record of bycatch.

**Recommendation 7:** *IFS to introduce a system sufficient to monitor bycatch, including protected species, in the Tasmanian Freshwater Eel Fishery and to identify changes in composition and abundance spatially and temporally.*

## Assessment

No bycatch assessment has been conducted in Tasmanian waters in relation to the Tasmanian Freshwater Eel Fishery. Anecdotal evidence, together with IFS staff compliance checks, indicates that the majority of fyke net bycatch is composed of either brown or rainbow trout species. These species have a high survival rate when caught in fyke nets and any mortality that does occur is considered sustainable by IFS given that both species have healthy populations in the state and are capable of reproducing within a water body.

IFS has been involved in a study, in conjunction with the Animal Ethics Committee that is aligned with DPIWE, to determine the effectiveness of different sized bycatch excluder screens on fyke nets to exclude bycatch (primarily platypus but also larger salmonids). The results of this study showed that the previous bycatch excluder screens of 140 mm stretched mesh size had the potential to allow juvenile platypus access to fyke nets. Consequently, the aperture size was reduced to the currently adopted 220 mm size aperture (110 mm stretched mesh) mesh size. This change has reportedly had no impact on the eel catchability or eel size range for the fyke nets.

DEH commends IFS' initiative in partaking in such research, but is concerned there is currently no mechanism in place to regularly monitor bycatch and therefore assess the effectiveness of modified excluder screens. While it has been shown that the existing mesh size has reduced the ability of fyke nets to catch bycatch, it is not possible for changes in the amount or composition of bycatch to be monitored. The ability to detect such changes may become increasingly important given that there are currently seven Tasmanian galaxiid species undergoing assessment for listing as threatened species under the EPBC Act. It is possible that the area of the fishery may overlap with the distribution of these species. DEH considers that more comprehensive collection of bycatch data is required from the Tasmanian Freshwater Eel Fishery and that a system to enable monitoring of bycatch overtime would benefit future management of the entire fishery. If such a system includes compulsory and comprehensive recording of bycatch through logbooks, DEH suggests that an education program to inform industry of bycatch reporting needs and species of concern be developed. A recommendation addressing this issue has been made (see **Recommendation 7**).

The submission states that should an IFS inspector report any unacceptable quantities of bycatch being caught and not released alive back into the waterbody, an assessment would be made by IFS commercial fisheries personnel. Because no performance indicators have been defined for the fishery, it is not clear from the submission what "unacceptable quantity" would trigger such an assessment. The assessment would determine whether the bycatch was based on natural biological patterns of the caught species or whether the catch was caused by the positioning of gear in relation to bycatch habitat. Upon determining if the event was a 'one off' or the probability of an unacceptable repeat capture and mortality of bycatch was high, licence conditions would be reviewed to either close off certain parts of that water or impose a total closure of that water. The *Inland Fisheries Act 1995* enables IFS to change or place any restrictions or conditions on a commercial eel fishers license at any time. While DEH considers that the impact of the Tasmanian Freshwater Eel Fishery on bycatch species is likely to be relatively low, DEH urges IFS to determine, as a priority, what constitutes an "unacceptable quantity of bycatch", and to set performance indicators that trigger additional management measures in relation to bycatch. A recommendation to this effect has been made (**Recommendation 7**).

## Management response

The main bycatch management arrangements utilised by IFS for the management of the Tasmanian Freshwater Eel Fishery are the provisions under the *Inland Fisheries Act 1995* and the *Inland Fisheries Regulations 1996*, that attempt to reduce the incidence of bycatch being caught, and if caught, maximise the chances of fish survival. These regulations include the following:

- Less than 1% of all Tasmanian rivers are open to commercial eel fishers
- All WHA's, National Parks and State Reserves are excluded from any commercial eel fishing
- Waters containing listed threatened or endangered species, as well as parts of waters that may contain significant populations of species vulnerable to capture (for example, fish spawning habitats), are excluded from waters allowed to be fished
- Fyke nets are limited in overall dimensions with minimum mesh size
- Eel traps are limited in overall dimensions with minimum mesh size
- All fyke nets are to be fitted with a 220 mm size aperture (110 mm stretched mesh) bycatch excluder screen to exclude any potential bycatch including platypus, water birds and larger salmonids, unless appropriate approval is given by IFS. Nets that are exempted from having bycatch excluder screens must have the codends raised a minimum of 300 mm above the water surface. Nets are only exempted when it is ascertained (through biological data) that the water contains a large proportion of large eels (>1.5 kg). Any bycatch that is caught must be immediately released upon clearing of nets.
- No commercial eel fisher or assistant when fishing is to take or have in their possession any other aquatic species other than eels
- Fyke nets are to be cleared every 24 hours
- All bycatch is to be immediately returned to the water (excluding noxious species).

IFS is of the opinion that the use of an indicator species to assess bycatch in the Tasmanian Freshwater Eel Fishery would be scientifically difficult and potentially meaningless given the relatively low commercial volumes of eels taken from Tasmanian waters and the relatively high abundance of any potential indicator species in relation to the eel population. In the submission IFS does acknowledge that native galaxiid species could potentially be used as an indicator species to monitor bycatch. However, there are inherent difficulties with this approach given that the majority of commercial eel fishing is based in lakes where galaxiid diversity is lower, and IFS regulations which generally restrict fishing in impoundments where these species occur. As a result, any bycatch monitoring using galaxiids as an indicator could not be conducted uniformly across the state. DEH agrees with this assessment.

## Conclusion

DEH considers that there is a high likelihood the fishery is conducted in a manner that does not threaten bycatch species. Should this situation change, or a risk assessment process indicate otherwise, DEH expects that IFS would undertake appropriate actions to ensure that this fishery does not threaten bycatch species.

A recommendation has been developed to ensure that the risk of unacceptable impacts on bycatch species is detected and minimised in the longer term (**Recommendation 2**).

## Protected species and threatened ecological community protection

Objective 2: *'The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities'*

### Information requirements

IFS's submission states that the distribution of Tasmania's endangered, threatened and protected aquatic fauna species is relatively well understood and documented. Similarly, the current distribution of commercial eel fishing activities is well known because IFS licences areas and specific waterways for commercial eel fishing, and because commercial eel fishers must note on their logbooks the name of any waterbody fished as well as the name of the waterbody that any eels are transferred into. There are currently no records or knowledge of threatened ecological communities that overlap with the Tasmanian Freshwater Eel Fishery. DEH considers that the Tasmanian Freshwater Eel Fishery would benefit from a robust reporting requirement for protected species interactions, and a recommendation to this effect has been made previously (see **Recommendation 7**).

As part of the commitment of IFS to minimise bycatch, any area that is known to contain listed endangered or threatened species is closed to commercial eel fishing. The only exception to this is where a lake based galaxiid species is currently being assessed for listing as 'vulnerable' under Tasmania's *Threatened Species Protection Act 1995*. Should this species be listed, IFS would need to reassess any bycatch of this species, and may need to ensure accurate data is recorded by the eel fisher documenting all bycatch and its status (released unharmed or dead). Similarly, there are currently seven Tasmanian galaxiid species being assessed for listing under the EPBC Act and, as with the species noted above, there is potential for the Tasmanian Freshwater Eel Fishery to interact with these species. However, the distribution of these species appears to be well known so it is likely that IFS would be able to provide adequate protection to these species.

### Assessment

DEH recognises that there has been little cause to analyse protected species interactions to date, given that the Tasmanian Freshwater Eel Fishery does not overlap with known listed ecological communities, and waters known to contain threatened species are closed to commercial eel fishing. However, if the galaxiid species noted above are listed under Tasmanian legislation or under the EPBC Act, IFS acknowledges that they will need to review the potential impact of commercial eel fishing on these species in light of their new status and to manage/regulate the fishing operations to ensure that it does not impose an unacceptable threat on the species. In addition, if future studies or reclassification of other relevant aquatic species or ecological communities indicate that there is an overlap between their distribution and commercial eel fishing, an assessment of the impacts on that species or ecological community will be conducted at that time. DEH expects that IFS will respond appropriately if it is found that the fishery is likely to result in interactions with protected species, and that IFS will seek to minimise the likelihood of such interactions.

### Management response

In addition to the measures described under Principle 2, Objective 1, IFS state that certain site-specific measures may be employed to ensure the integrity of areas of high conservation value or to protect endangered, threatened or protected species in Tasmania. For example, areas that are highly likely to contain threatened ecological communities such as WHA's, National Parks and State

Reserves are excluded from any commercial eel fishing. Other measures to avoid or minimise interactions with protected species and ecological communities have been outlined above.

Of the species likely to interact with the fishery, the most common type of negative interactions appears to be capture in fyke nets. The incidence of such bycatch has been minimised by previous studies which have resulted in the regulation of bycatch excluder screens of a size that prevents the capture of all platypuses, and therefore galaxiid species also, in fyke nets. It is a requirement of commercial eel fishing licences that all fyke nets be fitted with such screens or, if exempted, that the cod ends are raised a minimum of 300 mm from the surface of the water. There is also potential for species such as the 'Vulnerable' Tasmanian Giant Freshwater Crayfish (*Astacopsis gouldi*) to interact with the fishery through entanglement. However, licence holders are required to check all gear every 24 hours and release any bycatch. Consequently, it is unlikely that any interaction of this type would result in mortality of the protected species.

## Conclusion

DEH notes that there are minimal interactions with protected species in this fishery and considers that the fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities. Should this situation change, or a risk assessment process indicate otherwise, DEH suggests that appropriate actions be undertaken to ensure the fishery avoids mortality of or injury to these species and avoids or minimises impacts on threatened ecological communities.

## Minimising ecological impacts of fishing operations

Objective 3: *'The fishery is conducted, in a manner that minimises the impact of fishing operations on the ecosystem generally'*

### Information requirements

Information collection systems in place in the Tasmanian Freshwater Eel Fishery have been described under Principle 1, Objective 1 and Principle 2, Objective 1.

DEH notes the lack of information collection and research covering the fisheries impact on the ecosystem and environment generally. However, DEH understands that this lack of information is similar across a range of Australian and International fisheries and until appropriate research techniques and programs are developed and implemented this will continue to be the case. DEH strongly supports research in this area.

### Assessment

The most significant impact on the natural ecosystem is likely to be the exploitation of the target species and its impact on the size of the spawning biomass of eels. Throughout the submission IFS asserts that the impact of the fishery on the biomass is significantly reduced through the closure of approximately 99% of waterways to eel fishing (of which approximately 50% are in an unmodified state). In addition, the Tasmanian Freshwater Eel Fishery currently does not target emigrating silver eels, or immigrating glass eels, thus ensuring sufficient spawners remain to sustain the fishery. A recommendation to ensure that a glass eel fishery, if it were to develop in the future, is managed sustainably has been made (**Recommendation 6**). Ensuring that sustainable populations of eels remain was an issue discussed under Principle 1 of this report.

Most commercial eel fishing in Tasmania is conducted in waters that have been man-made (farm dams and hydro-electric impoundments) and artificially enhanced (restocked with eels). Some commercial eel fishers translocate eels from waters that receive natural recruitment to waters that do not. This practice has the potential to impact on the ecosystems within these waters, although the fact that eels are assumed to come from a panmictic stock, and that eels would have been able to recruit these waters prior to them being dammed and regulated, would suggest that the potential impact is not as significant as it may be for other species. A recommendation to explore the validity of the panmixia hypothesis for the longfinned and shortfinned eel has been made (**Recommendation 5**).

Food chain interactions may also be affected by operations of the fishery. The removal of a large predator from the system would be expected to result in some disturbance to food chains and the productivity of the environment. The submission contends that eels were the top predatory and scavenger species in Tasmania before the introduction of trout. It is expected that if an imbalance were to occur, trout could adequately cover this imbalance until more eels were recruited into the particular water body. Recruitment of eels to cover the imbalance would also be expected to occur rapidly since Tasmania has the largest known juvenile eel resource in Australia. DEH supports this contention.

Short-term impacts to productivity flow may also be expected to result from the removal of adult eels. However, the submission notes that waters where adult eels are taken are replenished with eels through natural recruitment and waters that commercial fishers choose to restock with juvenile eels (above artificial impoundments) are also replenished so that any drop in production is balanced. DEH accepts this conclusion.

As noted earlier in this report, there is potential for a glass eel fishery to develop in Tasmania with IFS recently issuing a permit allowing the collection of glass eels. If it is found that commercial quantities of glass eel are able to be harvested, the removal of this sector would be likely to have an impact on productivity flows. DEH considers it important that a measure is in place to ensure that such impacts do not occur. In the Victorian eel fishery, it is a requirement of the Bycatch Action Plan that a minimum of 10% by number of glass eels harvested under a permit be returned to waters from which they were taken as advanced pigmented elvers (minimum average size 2 g), under the supervision of departmental officers. DEH strongly recommends that IFS investigate the implementation of such a measure in the Tasmanian Freshwater Eel Fishery in the event that it is found that commercial quantities of glass eel can be harvested.

Impacts of the fishery on physical habitat and water quality are expected to be minimal. Some impacts on macrophytes, erosion of banks and associated turbidity, and/or disturbance of the benthic environment may occur through the use of small boats and fyke nets. However the submission notes that it is not in the fisher's best interest to adversely affect the surrounds where they actively fish, and this consideration for the surrounding environment largely minimises any significant impacts. Given that the fishery largely occurs in modified environments and the gear used in the fishery is relatively passive, impacts on physical habitat and water quality are considered to be low.

### **Management response**

The primary management tools used in the Tasmanian Freshwater Eel Fishery are the limits to commercial eel fishing activities to clearly defined reaches of a limited number of waters, using closely regulated gear which is passive and operated in such a way as to have minimal ecological impact. The submission asserts that the main area of concern outside the target stocks is the bycatch

of protected species. Management responses to address these concerns have been described under Principle 2, Objectives 1 and 2. In addition, surveillance of eel fishing activities by compliance staff helps provide further opportunities for independent monitoring of the fishery.

DEH is of the opinion that, while not directly addressing the impacts on the ecosystem, the generally precautionary nature of the eel fishery combined with the information collected and the reviews in place and/or proposed are commensurate with the scale and value of the fishery and will result in minimal impacts of fishing operations on the ecosystem.

IFS has developed a Risk Management Protocol to ensure that the risk of translocation of other species is reduced to an acceptable level. This Risk Management Protocol is complementary to the *National Policy for the Translocation of Live Aquatic Organisms 1999* and outlines methods that must be employed by commercial eel fishers during translocation to minimise impacts on ecosystems. This includes ensuring that all flora and fauna are eliminated prior to translocation, ensuring that no incidental bycatch survives transit to the transfer site and ensuring that all holding bags are thoroughly cleaned and dried before being used to transfer eels again.

Because the fishery operates near the Interlaken (Lake Crescent) Ramsar site, consideration needs to be given to potential impacts on this matter of national environmental significance by the Tasmanian Freshwater Eel Fishery. However, DEH considers that the fishery, if operated consistently with the current management regime, is unlikely to have a significant impact on the ecological character of the Interlaken (Lake Crescent) Ramsar site.

## **Conclusion**

DEH considers that the fishery is conducted in a sufficiently precautionary manner to minimise the impact of fishing operations on the ecosystem generally. A recommendation has been made previously regarding the potential development of a glass eel fishery in Tasmania (see **Recommendation 6**), which will ensure that the risk of significant impact by the fishery on the environment generally is minimised in the longer term.

The Tasmanian Freshwater Eel Fishery operates near the Interlaken (Lake Crescent) Ramsar site, and as such, impacts to this matter of national environmental significance have been considered. However, it is considered that the management regime in place is consistent with the values for which the Interlaken (Lake Crescent) Ramsar site was listed. In addition, the spatial restrictions on fishing within Tasmania's WHA's, ensure that impacts to WHA's are minimal. On this basis, DEH considers that an action taken by an individual fisher, acting in accordance with the fishery management regime, would not be expected to have a significant impact on the Ramsar Wetland or WHA's protected under the EPBC Act.

## **REFERENCES**

Henry, G.W. and Lyle, J. M. (2003) The National Recreational and Indigenous Fishing Survey, FRDC Project No. 99/158. Australian Government Department of Agriculture, Fisheries and Forestry, Canberra.

## **LIST OF ACRONYMS**

ANZERG	Australian and New Zealand Eel Reference Group
DEH	Department of the Environment and Heritage
DPIWE	Department of Primary Industries, Water and Environment
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
GIS	Geographic Information System
IFAC	Inland Fisheries Advisory Council
IFS	Inland Fisheries Service
NRIFS	National Recreational and Indigenous Fishing Survey
TPEFA	Tasmanian Professional Eel Fishers Association
UNCLOS	United Nations Convention on the Law of the Seas
WHA	World Heritage Area